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CONTRIBUTION OF THE BOW CORRIDOR ROCK INDUSTRY TO THE ALBERTA AND REGIONAL ECONOMY

Prepared for

Alberta Economic Development and Trade
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EXECUTIVE SUMMARY

CONTRIBUTION OF THE BOW CORRIDOR ROCK INDUSTRY TO THE ALBERTA AND REGIONAL ECONOMY

EXECUTIVE SUMMARY

This report outlines the importance of the mineral extraction and processing ("rock") industry to the economy of the Bow Corridor region and to the province of Alberta as a whole. The study was commissioned to provide useful information to the *Bow Corridor Local Integrated Resource Plan.* This plan, currently under review, will govern the management and use of public resources throughout the Bow River valley.

The term "rock industry" refers to mining and processing of non-metallic, non-petroleum minerals, including limestone, sand and gravel, magnesite and building stone. Since the beginning of the century, this industry sector has developed into a significant contributor to the Bow Corridor and provincial economies. Currently, the value of production exceeds $146 million a year. Planned expansions are expected to increase this production by approximately fifteen per cent per annum within two years.

The steady development of the rock industry in the Bow Corridor has come about for two reasons:

1. *Availability of High-Quality Resources:* The region possesses large quantities of stone, clay and shale, sand and gravel and limestone that are of very high quality. For example, the limestone deposits controlled by one regional company are 97% pure calcium carbonate--one of the highest-quality deposits known in North America.

2. *Availability of Infrastructure:* The region is served by a well-developed infrastructure, including rail and highway transportation links and gas/electricity supplies. The infrastructure has made it economically possible to develop the resources. In turn, this has attracted--and continues to attract--substantial investment capital to the region.

The Rock Industry Today:

At this point, the Bow Corridor region contains:

- 50% of Alberta's production of structural materials;
- 50% of Alberta's total limestone production;
- one of two lime plants in Alberta;
- one of two cement plants in Alberta;
- 100% of Canada's production of calcined and fused magnesia.

The replacement value for existing facilities exceeds $321.4 million, while new construction estimated at $52 million is planned for the near future.

Impact of the Rock Industry

The rock industry adds value to the economic and social viability of the Bow Corridor region and the province in the following ways:

1. *Economic contributions:* The industry generates direct and indirect economic benefits, including:
   - $72.6 million annually in out-of-province exports.
   - $30.2 million annually spent locally for goods and services.
   - $0.8 million collected annually as tax revenue in the Municipal District of Bighorn (48% of total tax revenue).
   - $369.4 million annually in direct, indirect and induced economic impact to the provincial economy.
   - 1,066 direct, indirect and induced jobs at the provincial and regional levels.

2. *Economic Stability:* The rock industry currently creates 332 direct, permanent jobs, for a total payroll of $15.6 million a year. Jobs in this industry are year-round positions, providing a counter-balance to the fluctuations associated with seasonal, temporary employment. Average weekly earnings in the industry are $350 higher than the aggregate figure for Alberta industry as a whole.

3. *Contribution to Other Industries:* The rock industry is an important supplier to companies in the construction, chemical, paper, pharmaceutical, food and beverage, natural gas and oil and agricultural industries. The availability of the industry's products in Alberta plays a major role in the viability of other sectors. For example, it is estimated that, without the existence of the Exshaw cement plant, the cost of cement for southern Alberta's construction industry would increase significantly.

4. *Economic Diversification:* A number of factors indicate the rock industry has a vital role to play in the diversification of Alberta's economy. These include: its stability as an employer; its current importance as a generator of economic benefits; its contributions to the viability of other sectors in the province; and its potential for the future long-term development of the economic and social base of the Bow Corridor.

Industry Potential

The rock industry in the Bow Corridor has substantial potential for growth. Investment in planned new facilities is estimated at $52 million, creating 47 new permanent jobs plus the associated economic spin-offs. Longer-term growth will be fueled by three factors.

1. Accessible, high-grade resources with a long life span: For instance, high-grade limestone reserves in the Bow Corridor have a life-span of more than 50 years.

2. Expanded markets in traditional industries: For example, the projected growth in the city of Calgary and the planned construction of tourist facilities throughout the region will require large amounts of construction materials.

3. New markets: Applications such as the use of limestone to neutralize acid soils or remove sulphur from fossil-fuel-burning operations have great potential for growth. Many of the products produced by the Bow Corridor Rock Industry are considered to be environmentally friendly and have a potential for replacing chemicals that are considered undesirable.

Conclusion

The Energy and Non-Renewable Resource Sub-Committee of the Environment Council of Alberta has recommended that land use policy should take the existence of known high-quality reserves into account, so that shorter-term land uses do not cut off access to such resources. It suggests that ". . . once potentially useful mineral deposits have been identified, steps may be taken to ensure that access to the deposits is maintained and that the option to exploit these resources is not squandered through lack of foresight." (Environment Council of Alberta, 1989, p.12.)

In summary, the Bow Corridor region and the province of Alberta benefit both economically and socially from the existing rock industry. In order to maintain a diverse economy, the region will require an expanded mining and processing base. To maintain balanced development that is complementary to all sectors, it will be necessary to recognize the contributions of this particular industry in developing land use plans for the Bow River Valley.

1.0 INTRODUCTION

1.0 INTRODUCTION

The Resource Planning Branch of the Department of Forestry, Lands and Wildlife was given the responsibility and mandate to coordinate the preparation of an integrated resource plan for the management and use of public resources throughout the Bow River valley. The development of the plan is in response to pressure from a variety of interest groups for the expansion of tourism and recreation, minerals development, urban expansion and wildlife habitat preservation. (Alberta Forestry, Lands and Wildlife, 1991)

Because of a growing interest in the Bow Corridor area becoming a tourism and recreation destination, the companies involved in mineral extraction and processing in the area expressed a desire and willingness to participate in the planning process for the region with a view to:

- providing assistance to the planning team in identifying opportunities for mineral extraction, development and processing in the region;
- having an opportunity to review and discuss planning issues within the region as they relate to the viability of the "rock" industry and industry in general; and
- collaborating with other stakeholder groups through the planning process in identifying appropriate land uses that are compatible with existing uses throughout the region.

Representatives of the Bow Corridor Rock Industry met with the Honorable Peter Elzinga, Minister of Economic Development and Trade and other members of cabinet for the purpose of exploring how the mineral extraction and processing industry could participate in the planning process and how the significance of the industry to the region could be formally documented for future reference and consideration. As a result, it was decided to contract the services of a private management consultant to develop a background report to outline the current and projected economic contribution of mineral extraction and processing to the Bow Corridor economy that offers an overview of why the "rock" industry is a key player in the economy of the region and the province of Alberta.

The key issues to be addressed were:

1. Assess the economic contribution of the major "rock" companies to the local economy and Alberta generally. This should include employment, income, taxes paid, exports, contracts to local suppliers and other factors which measure economic impact.

2. Assess the factors contributing to the competitiveness of these companies in their present location. This should consider access to the resource, quality or other unique properties of the resource, and any other factors which render the present location superior to other possible sites in the province.

3. Assess the future plans for expansion by existing producers (e.g., Baymag) and proposed new developments (e.g., National Silicates).

4. Develop an overall conclusion that clearly demonstrates why the interests of the "rock" producers should be recognized as part of the overall development plan for the Bow Valley Corridor.

In order to address these issues, some important steps followed by the consultant in the development of the report were to:

- research the literature with a view to identifying appropriate secondary sources pertaining to mineral extraction and processing in general and obtaining information on the industry within the regional and provincial context specifically;

- gather primary data through meetings with each of the major producers in the region, the Town of Canmore, the Municipal District (M.D.) of Bighorn and relevant Alberta Government staff;

- conduct the background research and data analysis needed to complete the report; and

- review the initial drafts of the report with industry and departmental representatives soliciting their comment and input.

Much of the information contained in this report was provided by Rock Industry representatives and officials from Alberta Economic Development and Trade, Alberta Energy, the Alberta Research Council and Alberta Treasury Bureau of Statistics. Their contribution and assistance is gratefully acknowledged. A compete listing of contributors to this report is provided in Appendix 4.

The following report is presented in five sections, as follows:

- A review of the mineral, physical infrastructure and industrial characteristics of the Bow-Corridor.
- A review of the Rock Industry's contribution to Alberta's goals for economic diversification and development and an overview of the economic impacts of the Rock Industry on the province's economy.
- An analysis and overview of the economic impacts of the Rock Industry on the economy of the Bow-Corridor.
- A discussion on the potential for future mineral development throughout the region.
- An overview of some suggested implications for future policy decisions.

The focus of the report is to describe the economic contribution of the "rock" industry to the economic well-being of the region and is not intended to address specific land-use matters. However some general observations have been presented with a view to provoking some thought and discussion.

2.0 KEY CHARACTERISTICS OF THE BOW CORRIDOR

Exhibit 1

PROFILE OF BOW CORRIDOR ROCK INDUSTRY

	BAYMAG	BURNCO ROCK PRODUCTS	CBR CEMENT CANADA LTD.	CONTINENTAL LIME LTD.	LAFARGE CANADA INC.	TOTALS
YEAR ESTABLISHED	1982	Company 1912 Bow Corridor- 1976	1963	1885	1906	-
NUMBER OF EMPLOYEES	100	13	-	56	163	332
ANNUAL PAYROLL($)	4,200,000	430,000	-	2,300,000	8,696,000	15,626,000
PRODUCTS MANUFACTURED/ MARKETED	Magnesium Oxide	Sand & Gravel, Ready Mix Concrete, Hot Mix Asphalt, Packaged Pre Mix	-	Lime & Ground Limestone	Various Cement Products	-
OPERATES PLANT	Yes(2)	Yes	No	Yes	Yes	-
OPERATES QUARRY	No	Yes	No	Yes	Yes	-
HOLDS LEASES	Yes	Yes	Yes	Yes	Yes	-

NB: The number of employees for each company listed above only refer to those employees who are directly employed within the Bow Corridor and does not include personnel located in the city of Calgary or other communities throughout the province.

2.0 KEY CHARACTERISTICS OF THE BOW CORRIDOR

The area - within the Bow Corridor sub-regional Integrated Resource Planning Area (exhibit 2, opposite page 6) - is a unique area known for its natural resources and processing opportunities for various mineral processing and rock industries. Large quantities of stone, clay and shale, sand and gravel and high purity limestones are located adjacent to Canada's national transportation corridor and serviced by well developed communities and an excellent mining infrastructure in the region. (Alberta Economic Development and Trade, 1990, pg 60)

The extraction and processing of industrial minerals has been taking place in the region since 1885 and the production of lime, portland cement, magnesium oxide and construction materials from these resources has provided employment and an above average standard of living for a large number of area residents. Continued investments have maintained the viability of these related industries and attracted new ones. A profile of the major companies - often referred to as the "Bow Corridor Rock Industry" - is provided in Exhibit 1, opposite page.

2.1 Minerals For Structural Materials

Limestone

Most of Alberta's high quality limestone resources are exposed along the strike of the Rocky Mountains and Foothills of southern and southwestern Alberta or at the margin of the Canadian Shield in the northeast. Over the years, total annual production of limestone in Alberta has increased from less than 500,000 tonnes prior to 1950 to approximately 1.8 million tonnes in 1974 (Holter, 1976) to an estimated 2.6 million tonnes in 1990 (Hamilton, 1991). High quality limestone resources of substantial provincial significance are extracted from the region accounting for approximately 50% of Alberta's total production. (Hamilton, 1991).

"The major uses of raw limestone are ... as a metallurgical flux in the iron and steel industry; and as a neutralizing agent for treatment of acid soils. Processed limestone yields a variety of compounds, the most important being hydraulic cement which reacts with water to form a hard crystalline mass. Mixed with water, sand, and gravel (or other types of aggregate), cement hardens to form concrete, a product of fundamental importance to the construction industry. Smaller amounts of limestone are quarried to produce quicklime and hydrated lime, which find diverse uses in the construction, chemical, {pulp and} paper-making, and agriculture industries. Metallic calcium and calcium chloride ($CaCl_2$), which have a variety of specialized industrial uses, are other common compounds produced from limestone." (Holter, 1976, pg 2)

During the past decade, limestone products have become particularly important in the treatment of high acid agricultural soils, water and sewer treatment and in the removal of sulphur from fossil fuel burning plants. Up to 90% of sulphur emissions are removed through the use of ground limestone and quick lime.

Sand and Gravel

As noted in Table 1, opposite page 12, the annual production of Sand and Gravel for the province expanded from 25.7 million tonnes in 1979 to 42.5 million tonnes in 1988. One of the most economical sources of accessible sand and gravel is located in the region two miles west of Gap Lake on Highway 1A. Some of the gravels are of extremely high quality and very suitable for use in the production of concrete and asphalt. Upwards of 10 million tonnes of good quality gravel and sand is located along Highway 1A and may be available for construction purposes. (Calgary Regional Planning Commission, 1977) (Industry calculations)

Stone

The production of dimension stone increased from 186 thousand tonnes in 1979 to 300 thousand tonnes valued at $2.1 million in 1988. See Table 1, opposite page 12. Production was mainly a very fine grained sandstone from quarries near Canmore. The terms siltstone, sandstone and Rundlestone all refer to different grades of stone mined from the same deposit. There are two quarries operating in the region producing ornamental and rock facing for construction and landscaping purposes. The Rundle Rock quarry is located north-west of Harvie Heights and the Thunderstone quarry is located southeast of Canmore near Pigeon Mountain. (Exhibit 2, opposite page 6)

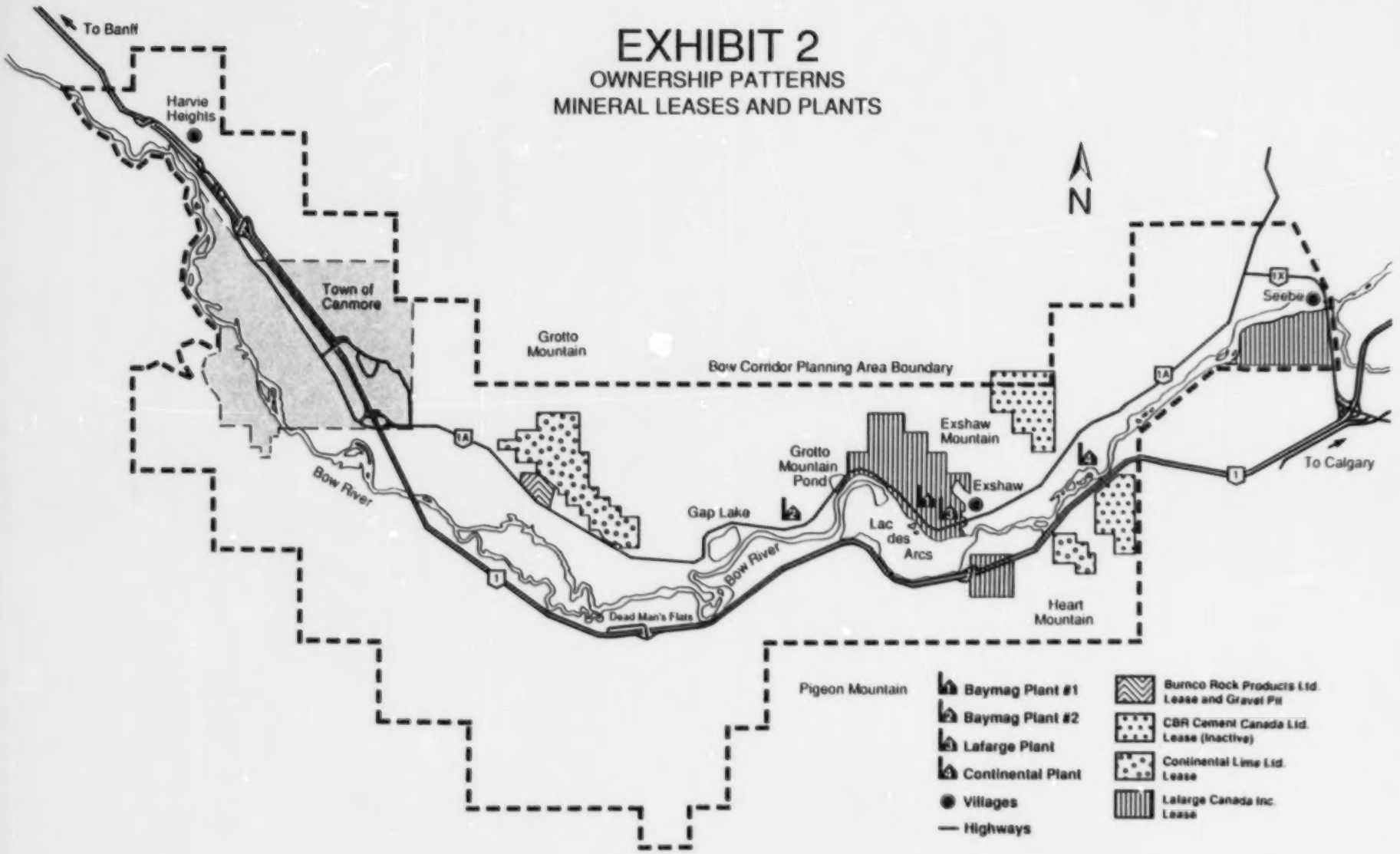
2.2 Infrastructure

In addition to an abundant supply of minerals that are easily accessible, the Bow Corridor region has a well developed physical infra-structure that includes:

- one of Alberta's major east-west transportation links, containing two major east-west highways - the Trans-Canada highway #1 and Highway #1A;
- the transcontinental line of the Canadian Pacific Railway;
- the Canadian Western Natural Gas gas pipeline; and
- two major electrical transmission lines and four hydro-electric generating plants at Spray Lakes, Rundle, Seebe and Horseshoe.

EXHIBIT 2

OWNERSHIP PATTERNS
MINERAL LEASES AND PLANTS



The past and current mineral extraction activity and investment within the region has been attracted by, and to some extent, has stimulated the development of an integrated physical infra-structure and related industrial base. Capital investment has attracted additional mineral processing industries to the region. For example, in addition to transportation and energy considerations, the existence of excess plant capacity for mineral processing was key to the decision of Baymag to locate its first major ore processing plant (Plant #1) in Exshaw.

In addition to existing capital investment, the availability of economical energy and transportation linkages to sources of high quality supply and markets has generated additional investment. Baymag constructed a second plant in the region during the late 80s and plans to build a third plant increasing its production capacity and employment base. In addition, National Silicates Ltd of Toronto has obtained approval to construct a plant near Exshaw scheduled to commence production of solid sodium silicate in 1992. The major mineral extraction and processing sites are located in the Municipal District of Bighorn within the boundaries of the Bow Corridor Integrated Resource Plan (IRP).The ownership pattern of mineral leases and plant locations throughout the IRP boundaries are outlined in Exhibit 2, opposite page.

2.3 Mineral Extraction and Processing Industries

The mineral extraction and processing industries in the Bow Corridor region play a major role in the much sought after diversification of Alberta's industrial and economic base by providing:

- unique structural material needed for major engineered works or major industrial development throughout the province;
- lime for the agriculture industry, the neutralization of industrial wastes and water and sewer treatment;
- magnesium oxide products used in the pulp and paper industry, for animal feed, acid neutralization, flue gas desulphurization and water treatment;
- environmentally safe derivatives of sodium silicate as alternatives to harmful phosphates and the pulp and paper kraft bleach process.

In addition to contributing to a stable economic base and creating permanent year-round employment in a region where it is needed, the industries make a significant contribution to Alberta's exports. For example, approximately $72.6 million or close to 50% of the structural material, lime and magnesium oxide produced in the region are for out-of-province sales and exports. (Table 3, opposite page 13)

Large capital infusions have been attracted into the region accompanied by managerial and technical expertise and in the process, several generations of regional talent have been trained and gainfully employed over the years. Continued investments have maintained the viability of these and related industries.

The following company profiles provide some insight into the historical, current and planned presence of mineral extraction and processing throughout the region. Some of the direct measures of economic impact in the region include: employment; value of production; capital investment; local taxes; provincial royalties; regional purchases; and exports. A recap of information for each company is provided in Appendix 1.

Baymag, a privately owned minerals processing company has been operating in the Bow Corridor since 1982. The company operates two separate facilities for the production of calcined and fused magnesia.

Plant I which is situated in Exshaw on the premises of Lafarge Canada Inc. produces calcined magnesia. The raw material is sourced from Baymag's open pit mine located at Mt. Brussilof near Radium Hot Springs, British Columbia and contains the purest coarse crystalline magnesite deposit known in the western world. The magnesite ore is stockpiled and crushed at the plant site and then processed through a rotary kiln and grinding/screening system. The applications of calcined magnesia are numerous and varied. The most important are:

- Animal Feed Supplement
- Pulp and Paper Industry
- Acid Neutralization
- Water Treatment
- Flue Gas Desulphurization
- Epsom Salt
- Fertilizer
- Cellulose Acetate
- MgO based Cements
- Uranium Refinement
- Sugar Refinement
- Rubber-Rayon Industry
- Pharmaceutical Industry

Plant II, located approximately 5 km west of Exshaw on Highway 1A, produces fused magnesia. This plant was built through 1988/89 utilizing state-of-the-art technology and is considered to be the most advanced magnesite fusing plant in the world. The raw material for this plant is sourced from Plant I and is automatically processed in computerized electric arc furnaces. The resulting product line, fused magnesia, is a high value industrial mineral and is used for producing the highest quality steel making refractory products, especially magnesia-carbon bricks.

The company is the second largest employer in the valley employing a total of 122 full-time employees (100 in Exshaw, 22 at the Calgary head office). Seventy employees reside with their families in the town of Canmore and 9 employees and their families reside in the M.D. of Bighorn. The annual local payroll is approximately $4.2 million and the contribution to the local tax base is approximately $94.5 thousand.

According to company figures, $3.5 million per annum of goods and services (including natural gas and electric power) are purchased in the communities of Exshaw, Canmore and Banff and $4.3 million per annum of goods and services are purchased in Calgary. The replacement value of existing facilities is estimated at $60 million.

The production during the past five years was close to capacity and is expected to increase once the planned Plant III comes on stream. The total sales during the past five years were in excess of $25 million annually of which in excess of 85% was exported out of Canada and approximately 5% was exported to other provinces.

In recognition of being one of the leaders in the export market at both the national and provincial levels, the company was awarded the "Canada Export Award" in 1988 and the "Alberta Export Award" in 1990.

The company is considering the construction of a third plant at an estimated cost of $40 million near Exshaw. The plant will have a potential annual capacity of 50 thousand m.t. of calcined magnesia product with a permanent work-force of 35 people.

Burnco Rock Products Ltd is a family-owned business that has been active in Alberta for 79 years and currently is a major supplier of sand and gravel, ready-mix concrete and asphalt throughout southern and central Alberta. The company's Bow Corridor operations consists of:

- a ready-mix concrete plant, shop, and truck storage facility all located within the Town of Canmore;
- a parcel of as yet undeveloped industrial land located in the Town of Canmore's Elk Run industrial park;
- two active gravel pits. The primary gravel pit is located at the SML 850084 lease site - leased from the Crown - north of highway 1A between Canmore and Exshaw, and the other gravel pit is located on land owned by Continental Lime Ltd. north of highway 1A, east of Exshaw.

A third deposit located in the Seebe area is inactive due to lower quality reserves and distances from the market. Extraction of sand and gravel from the third pit would result in higher market prices due to the additional costs associated with required extra washing and sorting and an additional 20 km truck haul. Information on value of annual production and sales is not available, however, according to representatives from the Alberta Research Council, the two active Burnco Rock Products Ltd leases are some of the best sources of sand and gravel in the province with known reserves estimated at 5 million tonnes.

The company directly employs thirteen full-time people at its Canmore operation with an annual payroll of $430 thousand. Two employees live in Harvie Heights, one in Exshaw and the other ten live in the Town of Canmore. According to company figures, approximately $200 thousand per annum is paid to four or five local independent truckers and in excess of $800 thousand per annum for supplies and services (other than trucking) from suppliers within the region. In the past, Burnco has purchased several million dollars of cement from Lafarge Canada Inc and several thousand dollars of stone from Thunderstone Quarries to meet company requirements in other areas of the province.

The replacement value of existing facilities is estimated at $1.4 million. The company intends to move its current Canmore ready-mix concrete and shop operations to a newly acquired lot in the Elk Run subdivision in Canmore resulting in an increase in capital investment of several hundred thousand dollars. Contribution to the local tax base was $10,050 and $10,970 during 1989 and 1990 respectively. Royalties paid during that same period were $68,820 and $44,389 respectively.

Continental Lime Ltd. has been located in the Bow Corridor since 1885 and controls limestone deposits that are 97% pure calcium carbonate. There are no known high calcium limestone deposits in western Canada or in the United States which are of comparable high quality. The limestone quarry is ideally located because of its close proximity to Highway 1A, the Trans Canada Highway, Canadian Pacific Rail and the Canadian Western Natural Gas pipeline.

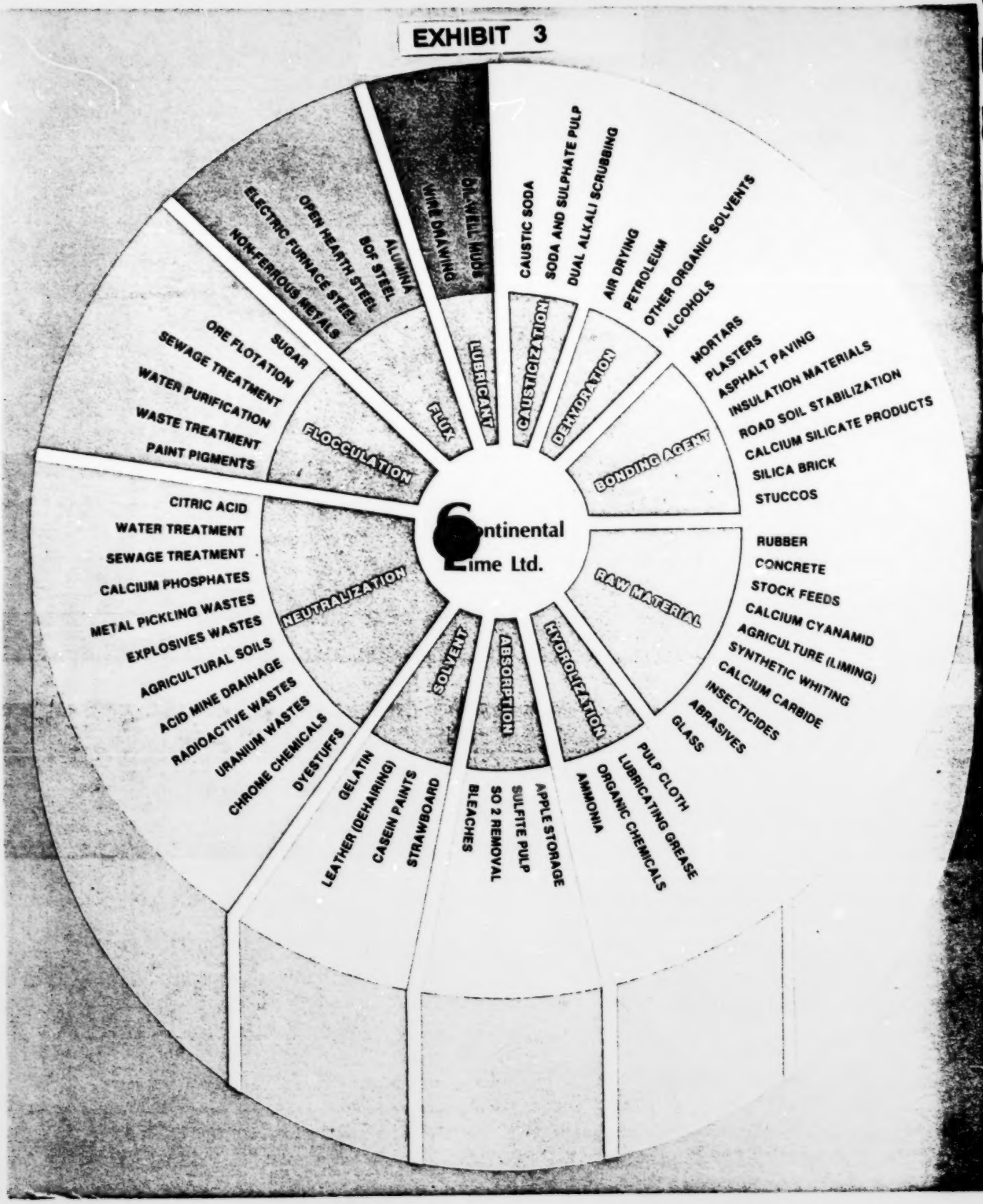
The company currently employes 56 full-time people at its Exshaw plant and 10 people in its Calgary office with a total annual payroll of $2.3 million. Approximately 42 employees and their families reside in the Town of Canmore and 14 employees and their families reside in the Municipal District of Bighorn.

According to company figures, $3.9 million per annum is paid to local independent truckers and in excess of $6 million per annum for other supplies and services (including power and natural gas) from local suppliers for a total of $9.9 million of purchases throughout the region. The annual contribution to the local taxation base is $77 thousand.

The replacement value of existing facilities is estimated to be $60 million. Future plans for expansion are dictated by current economic conditions and limestone reserves at the existing operating quarry at Gap Lake - which has a life expectancy of approximately 25 years - and a potential extractable limestone reserve at Heart Mountain.

The plant is currently operating at 87% of total annual production capacity of 350 thousand tonnes and manufactures 304.5 thousand tonnes of limestone and lime product. The product has broad industrial, municipal and domestic applications that range from use in desulphurization during the burning of fossil fuels to the treatment of water and sewer to

EXHIBIT 3


Continental Lime Ltd.
FLUX
OIL WELL MUDS
WIRE DRAWING
ALUMINA
BOF STEEL
OPEN HEARTH STEEL
ELECTRIC FURNACE STEEL
NON-FERROUS METALS
LUBRICANT
CAUSTICIZATION
CAUSTIC SODA
SODA AND SULPHATE PULP
DUAL ALKALI SCRUBBING
DEHYDRATION
AIR DRYING
PETROLEUM
OTHER ORGANIC SOLVENTS
ALCOHOLS
BONDING AGENT
MORTARS
PLASTERS
ASPHALT PAVING
INSULATION MATERIALS
ROAD SOIL STABILIZATION
CALCIUM SILICATE PRODUCTS
SILICA BRICK
STUCCOS
RAW MATERIAL
RUBBER
CONCRETE
STOCK FEEDS
CALCIUM CYANAMID
AGRICULTURE (LIMING)
SYNTHETIC WHITING
CALCIUM CARBIDE
INSECTICIDES
ABRASIVES
GLASS
HYDROLIZATION
PULP CLOTH
LUBRICATING GREASE
ORGANIC CHEMICALS
AMMONIA
ABSORPTION
APPLE STORAGE
SULFITE PULP
SO 2 REMOVAL
BLEACHES
SOLVENT
GELATIN
LEATHER (DEHAIRING)
CASEIN PAINTS
STRAWBOARD
NEUTRALIZATION
CITRIC ACID
WATER TREATMENT
SEWAGE TREATMENT
CALCIUM PHOSPHATES
METAL PICKLING WASTES
EXPLOSIVES WASTES
AGRICULTURAL SOILS
ACID MINE DRAINAGE
RADIOACTIVE WASTES
URANIUM WASTES
CHROME CHEMICALS
DYESTUFFS
FLOCCULATION
SUGAR
ORE FLOTATION
SEWAGE TREATMENT
WATER PURIFICATION
WASTE TREATMENT
PAINT PIGMENTS

the treatment of high acid agriculture soils. There is high growth potential through the use of limestone as a neutralizing agent for high acid agricultural soils throughout the province of Alberta and northeastern British Columbia. The varied application and uses of limestone and lime product from the Exshaw facility are outlined in Exhibit 3, opposite page.

Two hundred and fourteen thousand and five hundred (214,500) tonnes of current output are consumed by the Alberta market and 90 thousand tonnes are exported. Sales figures provided by the company indicate that the value of lime and limestone sales during the past four year period was averaged at $17 million per annum. During that same period, $5.1 million or 30% of total average annual sales were outside the province of Alberta.

Lafarge Canada Inc. has been operating a cement plant and limestone quarry at Exshaw since the early 1900s. The cement plant is ideally located because of its close proximity to high grade limestone. It was noted in Section 2 that the limestone reserves within the Bow Corridor are of a high quality and the most economically exploitable of known reserves due to a well developed energy distribution network (power and gas); and major transportation networks linked into provincial, Canadian and American markets.

The company currently employs 163 full-time people at its Exshaw plant and 37 people throughout the Calgary region. The total annual payroll for the Exshaw plant exceeds $8.6 million. Approximately 110 and 43 employees and their families reside in the Town of Canmore and Exshaw respectively.

According to company figures, an average of over $11 million per year of goods and services, including power and natural gas, were purchased over a five year period. The average annual purchases during the past five years in the communities of Banff, Canmore and Exshaw are as follows:

Banff	$ 300,000	
Canmore	650,000	
Exshaw	10,500,000	NB: includes purchases of power and natural gas
TOTAL	$ 11,450,000	

The estimated replacement value of existing facilities is $200 million with an annual investment of $3 million for on-going maintenance capital. The current two kilns are 10 and 15 years old and it should be noted that a new kiln at an existing location carries an investment requirement of roughly 1/2 that of a greenfield situation.

It is reported that the Exshaw plant produced an average of 870 thousand m.t. of cement per year during the 1987 to 1991 period. Based on the assumption that 1.5 tonnes of limestone are used to produce 1 tonne of cement, it is estimated that approximately 1.3 million tonnes of limestone were extracted from the existing Lafarge quarry during that same period for the production of cement product destined for Alberta, other provincial and United States markets. Sales figures provided by the company indicate that the value of cement sales during the past four year period was averaged at $102 million per annum. During that same period, $45 million or 44% of total average annual cement sales were outside the province of Alberta.

National Silicates Ltd. with head offices in Toronto, has obtained approval for the construction of a plant near Exshaw with a potential production capacity of 70 to 80 m.t. per day, or 275 thousand m.t. per year of solid sodium silicate. The cost of construction is estimated to be $12 million employing approximately 40 people during construction with a permanent work-force of 12 people.

The approval for environmental permits is currently under consideration. The Municipal Planning Commission of the M.D. of Bighorn has approved the development application and a development permit has been issued. Design work is in progress and the company anticipates commencing construction during the summer of 1991.

The plant will process sand from Golden, British Columbia and soda ash from Wyoming, U.S.A. into solid sodium silicate. The product will be shipped to its plant in Whitecourt, Alberta and other plants in British Columbia for further processing. Solid sodium silicate and its derivative - liquid silicate - is used in the production of zeolite, replacing environmentally harmful phosphates in the production of domestic and industrial detergents. Derivatives of solid sodium silicate are used for the de-inking of newspapers, magazines and other paper products during the recycling of paper as well as the production of silicate peroxide, which is used by selected pulp and paper industries as an alternate to kraft bleaching. For example, the company is a major supplier of silicate peroxide to the Millar Western pulp mill in Whitecourt.

3.0 ECONOMIC IMPACT OF THE BOW CORRIDOR ROCK INDUSTRY ON THE ALBERTA ECONOMY

Table 1

STRUCTURAL MATERIAL PRODUCTION - ALBERTA

	Units	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Cement	$,000	97,482	97,000	94,848	163,717	126,860	120,071	148,882	113,371	116,947	126,545
	'000 Tonnes	1,336	1,155	1,455	1,518	1,190	990	1,143	949	1,107	1,153
Sand & Gravel	$,000	56,044	55,219	97,323	129,664	126,354	105,001	121,668	133,092	137,523	133,875
	'000 Tonnes	25,727	24,334	26,465	46,092	43,789	45,494	49,287	45,128	44,050	42,500
Clay Products	$,000	12,556	13,200	15,308	11,220	12,207	8,153	7,828	10,158	14,183	9,832
Lime	$,000	7,031	8,800	11,047	9,888	10,300	13,677	14,990	16,196	19,194	17,642
	'000 Tonnes	162	184	183	151	146	160	141	193	213	186
Stone	$,000	990	1,034	2,017	3,161	3,457	3,416	3,116	1,315	1,532	2,100
	'000 Tonnes	186	193	271	264	286	258	225	229	249	300
TOTAL CANADA	**$,000**	**1,646,015**	**1,668,577**	**1,776,974**	**1,729,584**	**1,833,973**	**1,951,483**	**2,125,219**	**2,341,123**	**2,743,770**	**2,863,582**
TOTAL ALBERTA	**$,000**	**174,103**	**175,253**	**220,543**	**317,650**	**279,178**	**250,318**	**296,484**	**274,132**	**289,379**	**289,994**
PERCENTAGE		**11%**	**11%**	**12%**	**18%**	**15%**	**13%**	**14%**	**12%**	**11%**	**10%**

Source: Statistics Canada, Catalogue No. 26-201

Note: Magnesium Oxide is not a structural material and is therefore not included in the above.

Table 2

STRUCTURAL COMMODITY PRODUCTION, ALBERTA

	CEMENT		LIME		SAND & GRAVEL		STONE		CLAY PRODUCTS		TOTAL
	$,000	%	$,000	%	$,000	%	$,000	%	$,000	%	$,000
1979	97,482	56	7,031	4	56,044	32	990	1	12,556	7	**174,103**
1980	97,000	55	8,800	5	55,219	32	1,034	1	13,200	8	**175,253**
1981	94,848	43	11,047	5	97,323	44	2,017	1	15,308	7	**220,543**
1982	163,717	52	9,888	3	129,664	41	3,161	1	11,220	4	**317,650**
1983	126,860	45	10,300	4	126,354	45	3,457	1	12,207	4	**279,178**
1984	120,071	48	13,677	5	105,001	42	3,416	1	8,153	3	**250,318**
1985	148,882	50	14,990	5	121,668	41	3,116	1	7,828	3	**296,484**
1986	113,371	41	16,196	6	133,092	49	1,315	0.5	10,158	4	**274,132**
1987	116,947	40	19,194	7	137,523	48	1,532	1	14,183	5	**289,379**
1988	126,545	44	17,642	6	133,876	46	2,100	1	9,832	3	**289,995**

Source: Statistics Canada, Catalogue No. 26-201

Note: Magnesium Oxide is not a structural material and is therefore not included in the above.

3.0 ECONOMIC IMPACT OF THE BOW CORRIDOR ROCK INDUSTRY ON THE ALBERTA ECONOMY

As previously indicated, the production of construction or structural materials for provincial and local industry accounts for a significant share of total mineral production throughout Alberta and Canada. Materials for this group include cement, sand and gravel, clay products, lime, and stone all of which are vital to the economic diversification and planned developments throughout the province and specific regions such as the Bow-Corridor.

3.1 Total Mineral Extraction and Processing Activity in Alberta

As noted in Table 1, opposite page, structural material production in Alberta increased from approximately 27.4 million tonnes in 1979 valued at $174.1 million to approximately 44.2 million tonnes in 1988 valued at approximately $290 million - an increase of 62% in tonnes of production. Of the total Canadian production of structural materials during the same period, Alberta's share fluctuated from approximately 10% to 18% for an overall average share of national production during the decade of 12.7%.

The annual output of structural material is closely tied to investment and construction activity throughout the province and western Canada and as the Alberta economy continues to expand and diversify, construction or structural materials will increase in importance. Production in the province is estimated to increase by 10 to 15% resulting in an increase in Alberta's annual share of national production to approximately 14% to 15% over the next five years. (industry figures).

Table 2, opposite page, lists the annual value of structural material production for Alberta by commodity. Cement production of $126,545,000 in 1988 accounted for 44% of Alberta's total structural material production in that year. The production of sand and gravel, and lime during 1988 accounted for 46% and 6% of annual provincial production respectively. A significant portion of Alberta's total structural material production comes from the Bow Corridor and consequently, the mineral extraction and processing industry within the area is an important and vital link in the development and economic diversification of the province.

TABLE 3

BOW CORRIDOR
CURRENT MINERAL EXTRACTION & PROCESSING ACTIVITY - BY COMPANY

	Employees	Wage & Salaries 1990	Replacement Val. Existing Facilities	Av. Annual Value of Production	Av. Annual Value of Exports	Av. Annual Goods & Services	Municipal Taxes 1 990
units	0.00	$,000	$,000	$,000	$,000	$,000	$,000
Baymag - Plants I & II	100	4,200	60,000	25,000	22,500	7,800	94
Bumco Rock Products	13	430	1,400	2,500	n/a	1,000	12
Continental Lime Ltd	56	2,300	60,000	17,000*	5,100	9,937	77
Lafarge Canada Inc.	163	8,696	200,000	102,000	45,000	11,450	628
Total Current Operations	**332**	**15,626**	**321,400**	**146,500**	**72,600**	**30,187**	**811**

Sources: Estimates provided by companies.

Note: Above data for the Bow Corridor operations only. Exports include shipments to other Canadian provinces.

Company data on value of production, exports and purchases of goods & services are based on five year averages for the period 1985 to 1990.

*** Includes lime and limestone**

3.2 Direct Provincial Economic Impact of the Bow Corridor Rock Industry

The aggregate of key direct measures of economic impact throughout the provincial and regional economy from mineral extraction and processing activity in the Bow Corridor are relatively easy to measure through some of the more significant indicators such as: wages; number of employees; capital investments; value of production; value of exports to name a few. These direct measures are informative but understate the cumulative economic impact and must be supplemented by measures of indirect and induced economic effects. (Nickel, 1978)

While the direct impacts are useful as an approximation of the importance of mining to a particular region, qualitative assessment can be enhanced through the use of economic multipliers. For example, major purchases made for repair and maintenance, fuel and utilities, chemical products, transportation services, and machinery and equipment and income earned (or value added) in mining - as in other industries - will have a multiplier effect in the economy generally. The economic impact of mineral extraction and processing through backwardly-linked industries and the re-spending of incomes compares favorable with other industries. In comparing mining with other industries, Nickel et al found no evidence that mining "... has either a remarkably low or a remarkably high 'multiplier' effect, whether expressed in terms of income or employment." (ibid, pg 21) "However, mineral extraction and processing industries employ more capital and less labour than the 'average' industry and has consistently paid above-average wages and made a disproportionate {higher} contribution to Canadian exports." (ibid, pg 20) Table 3, opposite page provides a summary of the principle statistics for companies operating in the Bow Corridor.

Alberta's share of Canadian structural material production during 1988 is estimated to be 10% (Table 1). As noted in Table 3, the gross value of mineral production in the region during 1990 - as reported by the companies - was $146,500,000 of which approximately 50% was exported to other provinces, to the United States of America or other countries resulting in a significant contribution to Alberta's exports. Of the total value of out-of-province sales and exports from all plants in the region, approximately 31% came from the Baymag plants; 62% from Lafarge Canada Inc. and 7% from Continental Lime Ltd. Baymag is the only producer of calcined and fused magnesia in Canada and is a significant contributor to the region's and Alberta's exports. According to figures provided by the company, the amount of calcined and fused magnesia produced and sold during 1990 was valued at $25 million of which approximately $22.5 million or 90% was for out-of-province sales and exports.

TABLE 4

DIRECT, INDIRECT & INDUCED PROVINCIAL ECONOMIC IMPACT
BOW CORRIDOR ROCK INDUSTRY - BY COMPANY

	Household Income	GDP @ Factor Cost	Gross Output	Employment
units	$,000	$,000	$,000	0.00
Baymag - Plants I & II	15,300	22,700	63,200	221
Bumco Rock Products	1,500	2,300	6,300	29
Continental Lime Ltd	10,400	15,400	42,900	124
Lafarge Canada Inc.	62,400	92,600	257,000	361
Total Current Operations	**$89,600**	**$133,000**	**$369,400**	**735**
PLANNED CONSTRUCTION				
Baymag - Plant III - New Construction	28,700	38,600	110,000	100
National Silicates - New Construction	8,600	11,600	33,000	100
Total New Construction	**$37,300**	**$50,200**	**$143,000**	**200**
NEW PLANT - OPERATIONS				
Baymag - Plant III - New Plant	7,700	11,400	31,200	78
National Silicates - New Plant	N/A	N/A	N/A	53
Total New Plant Operations	**$7,700**	**$11,400**	**$31,200**	**131**
TOTAL ECONOMIC IMPACT - ALBERTA	**$134,600**	**$194,600**	**$543,600**	**1,066**

Sources: Calculations based upon informationprovided by companies and multipliers provided by Alberta Bureau of Statistics, 1991
Note: N/A = Not Available

DEFINITIONS

Household Income:
The sum of wages, salaries and supplementary labour income; military pay and allowances; net income of unincorporated business; interest, dividends and miscellaneous investment income.

Gross Domestic Product (GDP) at factor cost:
The sum of household income described above and inventory valuation adjustment and operating surplus, which includes profits, investment income, and capital consumption allowances.

Employment
The number of paid and non-paid workers (self employed, etc.)

Gross Output
This equals shipments adjusted for inventory change.

The companies directly employ 332 people in their Bow Corridor operations representing an average of 2.2 direct man-years of employment per million dollars of output or 1 direct man-year of employment per million dollars of capital invested. The level of capital investment and value of output relative to employment levels indicate that the industry has attracted a high level of investment into the province which is supportive of provincial economic diversification goals.

3.3 Total Provincial Economic Impact

Indirect impacts on the Alberta economy of the mineral extraction and processing industries in the Bow Corridor region are felt through the stimulation of linked industries. The companies are important suppliers to Alberta construction, chemical, paper, pharmaceutical, food and beverage, gas and oil, and, agricultural industries. They are also important buyers of transportation, natural gas, electrical power, wholesale and retail trade services incidental to mining, and other industries.

The Energy and Non-Renewable Resources Sub-Committee of the Public Advisory Committees to the Environment Council of Alberta report that the value of production of structural materials (cement, sand and gravel, clay products, lime, stone) during 1987 accounted for approximately 1/3 of the total value of mineral production (excluding fuels) in Alberta and accounts for about 41% of structural materials produced in Western Canada. The Council reports that "... plants that use industrial minerals as raw materials account for 5.8 percent of total manufacturing employment within the province. Industries producing products such as cement, ready-mix concrete ... and lime have key roles to play in Alberta's growth." and that "... expanded mineral development could be profoundly important to Alberta in terms of economic diversification, employment, geological and mining technology, and human resource development." (Environment Council of Alberta, 1989, pg 3) Those observations underscore the importance of the economic impact of the region's rock industry on the economic diversification of Alberta through the stimulation of linked industries. The direct, indirect and induced effects of the Bow Corridor Rock Industry's activity in the Alberta economy are provided in Table 4, opposite page.

The multipliers used to identify the direct, indirect and induced effects on the provincial economy are based on the 1984 provincial closed input-output tables developed and provided by the Alberta Treasury Bureau of Statistics (1991). Copies of the multiplier tables for Alberta industries and commodities used in calculating the contribution of each company to the provincial economy are provided in Appendix 2.

The total impact on the provincial GDP at factor cost is calculated at $194,600,000 of which approximately $50,200,000 or 32% may be attributed to the impact of new plant construction and operations. The total impact on employment is 1,066 of which 200 or approximately 19% may be attributed to the impact of new plant construction and operations.

Although the mining industry is capital intensive, the percentage increase in employment, once the new plants are on stream would be approximately 39% resulting in corresponding increases in household incomes. (NB: the percentage changes in employment and household incomes would be higher if production figures for National Silicates' new plant were provided) Detailed calculations for planned construction, current plant operations and new plant operations for each company are provided in Appendix 3.

The immediate impact of existing plants, new plant construction and longer-term impact once the new plants become operational indicate significant increases during 1990 and 1991 on: household incomes ($134,600,000); GDP ($194,600,000); Gross output ($543,600,000); and employment (1,066) reinforcing the assertions of Nickel, et al " ... that per dollar of output, per dollar of value added, or per person employed in mineral extraction and processing, in dollars of income earned or persons employed elsewhere in the economy are in about the same ratio as for other industries." ((Nickel, 1978, pg 18)

For every million dollars worth of output in the extraction and processing of non-metallic mineral products there is an approximate total increase of $2.5 million in the province's gross output. For each additional million dollars of output of non-metallic mineral products, total provincial incomes are increased by approximately $700 thousand and household incomes are increased by approximately $600 thousand.

4.0 ECONOMIC IMPACT OF THE BOW CORRIDOR ROCK INDUSTRY ON THE BOW CORRIDOR ECONOMY

4.0 ECONOMIC IMPACT OF THE BOW CORRIDOR ROCK INDUSTRY ON THE BOW CORRIDOR ECONOMY

As Nickels, et al observe, "The impacts of mining on regions smaller than a province have not been as thoroughly studied ... even though the impacts of mineral extraction and processing are most obvious within a region, {such as Bow Corridor} particularly through local expenditures at the operating phase." (ibid, pg 59) The authors suggest that provincial multipliers may be used to measure regional impacts and linkages, however, several problems are associated with that approach including:

- unavailable input-output data for the region;
- inability to describe the nature of the regional economic structure (the Town of Canmore is currently studying its economic structure including purchasing patterns -- no studies are being conducted for the Bow Corridor region);
- insufficient data describing imports and exports for the region.

In spite of those difficulties, it may be assumed through observation that the mineral extraction and processing industry has a significant regional economic impact and a fair portion of the provincial economic shifts will be distributed throughout the region. Capital investment expenditures tend to flow throughout the more developed regions of a province while operating expenditures are available to and felt throughout the local economy, consequently, any positive or negative change in operations through plant closures or expansion have a visible and dramatic impact at the local level.

4.1 Regional Income

The Rock Industry generates business opportunities throughout the Bow Corridor through the local purchases of equipment, materials and services and, the subsequent re-spending of local direct and indirect incomes on consumer goods and services in the region. There will be an increase in business activity during new plant construction as well as increased population in the region once the new plants become operational. The re-spending of construction and new operations workers' disposable income will increase business activity among consumer businesses and services resulting in the further re-spending of local businesses and wage earner disposable incomes throughout the Bow Corridor.

Not all re-spending will be retained in the region. Some goods and services will be purchased outside the Bow Corridor by both local businesses and wage earners and therefore provincial incomes have been reduced in estimating the portion that may stay within the Bow Corridor region. It is assumed that approximately 50% of disposable regional income is spent on goods and services outside the region and consequently, the provincial multiplier has been reduced by an equivalent per cent. The impact on regional

household incomes of existing plants, new plant construction and longer-term impact once the new plants become operational is estimated to be $67.3 million per year. For each additional million dollars of output of non-metallic mineral products, total regional incomes are increased by approximately $450 thousand and household incomes are increased by approximately $300 thousand.

In addition to impacts at the provincial level, there are specific effects that are most noticeable locally. For example, the Calgary Regional Planning Commission (CRPC) states that businesses that have a higher ratio of sales outside of the area than within are more important generators of local services and employment than the businesses with lower ratios. (CRPC, 10-77-33) Comparisons of the Value of Production and Value of Exports indicate that the Bow Corridor Rock industries have high ratios and are important to the ability of the region to attract outside investment.

4.2 Employment

The relative importance of mineral extraction and processing is also reflected in the region's employment base. There are currently a total of 332 year-round full-time employees employed at the plants. According to the aggregate of figures provided by the companies, of the 332 plant employees, 232 reside in the Town of Canmore and 69 reside in Exshaw and other hamlets throughout the M.D. of Bighorn. Based on the total of permanent direct jobs for all plants, approximately 90% of all employees (301) reside within the region.

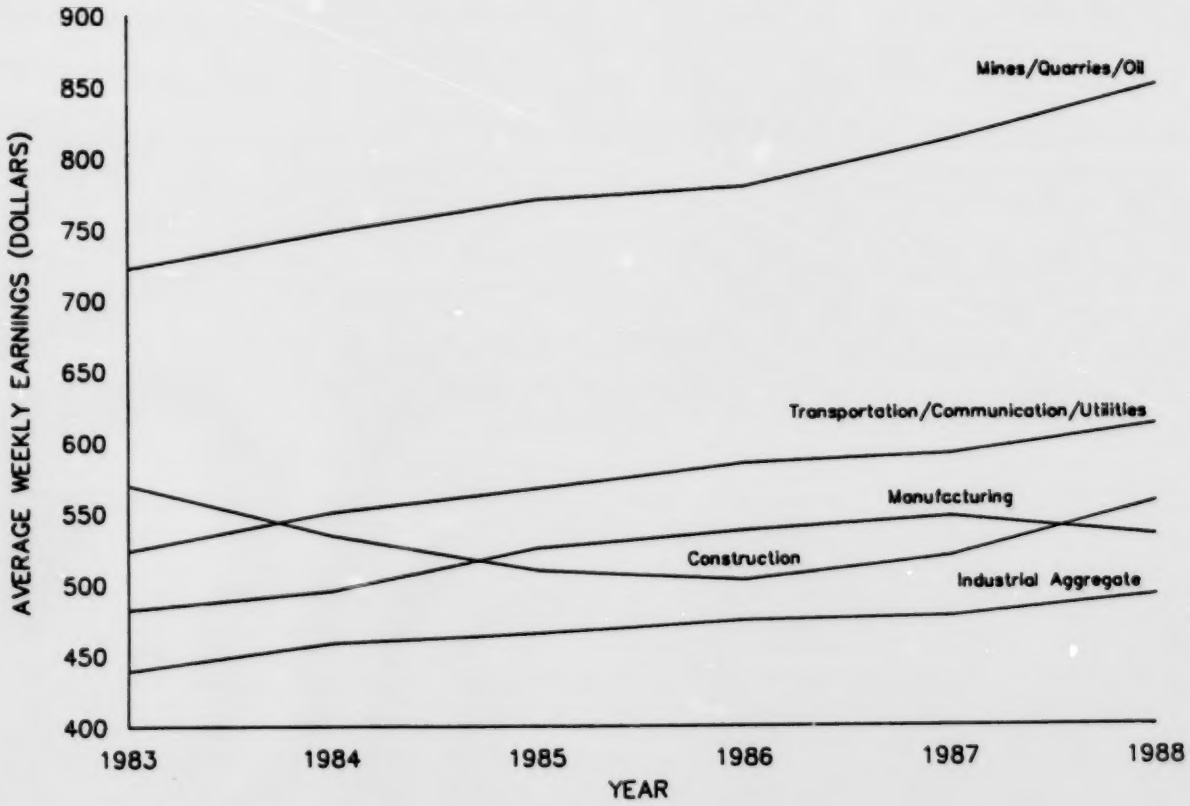
It is estimated that approximately 80 person years of employment will be involved in the construction of the third Baymag and the National Silicates plants. On the assumption that the majority of those positions will be filled from skilled labor pools from outside the region and only a small portion of their income will be spent throughout the region, nevertheless, the regional spending of construction workers, however small, will generate income and spending in other sectors of the regional economy. It is conservatively estimated that 10 indirect and induced jobs will be created within the region during the construction activity.

Approximately 47 new direct jobs will be created once the new plants are operational. Assuming that the 90/10 local resident to non-resident ratio is consistent and excluding the impacts during construction, it is estimated that 42 new operational employees and their families will reside in the region. These new jobs combined with the 301 direct jobs in the existing plants will result in an estimated total of 343 plant employees and their families residing in the Town of Canmore and the M.D. of Bighorn.

EXHIBIT 4

AVERAGE WEEKLY EARNINGS ABOVE AGGREGATE

Source: Alberta Bureau of Statistics



Calgary Regional Planning Commission. 1989. Prospect '89: Issues in Employment and Income. Calgary Regional Planning Commission, Calgary.

Specific data regarding resident purchasing patterns throughout the region are not available however, it is assumed that some resident employees will spend a portion of their salaries on goods and services in Calgary and other communities outside the region and a portion within. The re-spending of disposable incomes will generate some income, employment and re-spending throughout the region and assuming that there are leakages, a more modest employment multiplier than the provincial is used in estimating the impact on the region's employment base. Using a multiplier of 1.5, the direct, indirect and induced impact on employment throughout the region would be (332 +47) x 1.5 or 569 jobs. Assuming that the current 90/10 ratio of resident to non-resident ratio remains constant, approximately 512 employees and their families will reside in the Bow Corridor region.

The creation of basic jobs that are permanent non-seasonal or year-round provides stability and some counter-balance to fluctuations associated with seasonal, temporary employment normally found in the service industries. The Calgary Regional Planning Commission, in a very recent study on employment and income patterns, report that according to provincial statistics, weekly earnings in mines and quarries during the period 1983 to 1988 were consistently above the industrial aggregate for the region and report that: "Earnings in the mines, quarries, and oil wells sector consistently led all other major industry groups, ...". (CRPC, 1989, pg 29). Exhibit 4 outlines the trends for those industries where weekly earnings averaged higher than the industrial aggregate. It is suggested that "... the differences in average weekly earnings among the major industry groups may reflect the proportion of {full-time} professional people or highly-skilled trades people employed in the sector (a higher proportion contribute to above-average earnings) or the proportion of part-time positions in the sector (a higher proportion would contribute to below-average earnings)." (CRPC, 1989, pg 34)

Exhibit 4 depicts considerable disparity of weekly earnings by industry. For example, the industrial aggregate or baseline during 1988 is estimated at $475 per week while the average weekly earnings in the mines/quarries/oil sector is approximately $825 or $350 above the baseline. Considering the above-average weekly earnings relative to the industrial aggregate and other industries, the contribution by the mineral extraction and processing industry to the employment base and income levels throughout the Bow Corridor region is considerable, particularly in comparison to other industrial sectors within the region.

EXHIBIT 5

BOW CORRIDOR ROCK INDUSTRY - LOCAL SUPPLIERS

BANFF

Alberta Motor Association - Travel Agency
Avis Canada
Banff Bulk Fuels Ltd
Banff Centre
Banff Crag and Canyon
Banff Crane Service
Banff Film Labs
Banff Park Lodge
Banff Rocky Mountain Resort
Banff Springs Hotel
Bow Valley Office Supplies
Brewster Transport Co. Ltd
Brewster Transportation and Tours
Joe's Upholstery
Rimrock Inn
Tilden Rent-A-Car Service
Timberline Towing Ltd.
Tridon Paging Systems

CANMORE

Action Parts (Canmore) Ltd.
Al Madden Catering
Alberta International Sled Dog Classic
Alistair Justason Design Corp.
Allen and Alger
Arco Carpentry
Big Mountain Refrigeration
Bighorn Sheet Metal Ltd.
Bow Valley Business Services
Bow Valley Credit Union
Bow Valley Motel
Bow Valley Patrol Ltd.
Bremner Engineering and Construction
Cablevision Bow Valley
Can-Bow Motors
Canmore Automotive Parts
Canmore Contracting Ltd.
Canmore Corridor Lumber Ltd.
Canmore Courier and Transport
Canmore Electric Ltd.
Canmore Glass and Screen Ltd
Canmore Helicopters
Canmore Leader
Canmore Lions Club Disaster Fund
Canmore Lock Service Ltd.
Canmore Medical Clinic
Canmore Municipal Hospital
Canmore Printcraft Ltd.
Canmore Rose and Crown
Canmore Septic Tank
Canmore Taxi
Canmore Tire Centre Ltd.
Canmore Woodcrafters Ltd.
Cascade Engineering Ltd.
Cascade Service

CANMORE (Cont'd)

Castle Mountain Home Furnishings
Chuckwagon Video Centre
Cornerstone Cribbing
Eklaf and Son Agencies Ltd.
Fas Gas
Fireside Inn
First Stop Mufflers Ltd.
Georgetown Electrical Ltd.
Gerry's Janitorial
Gibson Construction
Handy Andy's Maintenance
Heinz Canmore Ford Mercury
JW Rea Trucking Ltd.
Lockwood Auto Body
M.J. Landscaping
Macleods
Mantie's Trucking and Backhoe
Marra's Grocery
Midway Automotive
Monarch Cable TV Ltd
Mountainview Supermarket
P.R. Contract Installations
Palmer's Welding
Pizza Construction Co.
R. D. Building Supplies
R. Joy Rentals
Radio Shack
Restwell Trailer Park and Cabins
Reymolds Refrigeration Ltd.
Ridgewood Signcrafters
Rock Mountain Silkscreen
Rodmoroff Enterprises
Sherwood House
Skiland Motel
Snap-on-Tools
Starlite Vacuums
T.J. Excavating Ltd.
Thompson Masonary Limited
Tire Town
Town of Canmore
West Bow Plumbing & Heating Ltd.
Valley Building materials Ltd.
Valley Flowers
Valley Group
War Buck Construction

EXSHAW

Atcor Ltd
Buddy Boys Trucking
D-Cools Cafe
Exshaw Community Association
Lamb Consulting
Municipal District of Bighorn
Transalta Utilities Corporation

4.3 Purchasing Patterns

An analysis of purchasing patterns is used to determine how the various sectors are interacting. Although no current local information is available, information provided by the companies surveyed indicate that there are some cash-flow linkages within the region. Burnco Rock Products Ltd. report that they have purchased several million dollars of cement from Lafarge while Lafarge indicate they obtain shale from other suppliers in the region. More specifically, the total paid for local goods and services throughout the region -- as reported by the companies and noted in Table 3 -- was in excess of $30 million during 1990. The direct impact through purchases of local services and specifically those services incidental to mining -- such as trucking, power, natural gas and maintenance -- suggest that a fair degree of regional income is generated through mineral extraction and processing activities. A list of typical local suppliers providing services to the companies is outlined in Exhibit 5, opposite page.

Energy expenditures and costs associated with supplier's overhead, labor overhead (U.I.C., Canada Pension, Workers Compensation) and supplier purchases from outside the region will account for the major leakage of regional income. It is suggested that "...energy comprises 40% of direct costs associated with producing cement ..." (Alberta Energy, 1989). Based on the assumption that the other mineral processing companies incur similar direct costs for energy, it is estimated that the gross regional income would be $17.3 million.

TABLE 5

M. D. of BIGHORN
MUNICIPAL ASSESSMENT AND TAXES
MINERAL EXTRACTION & PROCESSING INDUSTRY

		MUNICIPAL TOTAL	BAYMAG	BURNCO	CONTINENTAL	LAFARGE	TOTAL	PERCENTAGE
MUNICIPAL ASSESSMENT		**$130,719,000**	$6,746,270	$102,180	$5,500,360	$44,783,010	$57,131,820	44%
MUNICIPAL TAXES	**LEVY**	**MUNICIPAL**	**BAYMAG TAXES**	**BURNCO TAXES**	**CONTINENTAL TAXES**	**LAFARGE TAXES**	**TOTAL INDUSTRY TAXES**	**PERCENTAGE INDUSTRY CONTRIBUTION**
General Operations	7.37	$963,399	$49,720	$753	$40,538	$330,051	$421,062	44%
HOSPITAL SUPPLEMENTARY								
Canmore #80	0.05	6,536	337	5	275	2,239	$2,857	44%
SCHOOL								
Provincial School Foundation	4.34	418,468	29,279	443	23,872	194,358	$247,952	59%
SCHOOL SUPPLEMENTARY								
Exshaw S.D. #1699	2.25	294,118	15,179	230	12,376	100,762	$128,547	44%
TOTAL TAXES		$1,682,521	$94,515	$1,432	$77,060	$627,410	$800,417	48%
PERCENTAGE BY COMPANY			6%	1%	5%	37%		

NOTE: **Burnco Rock Products Ltd also contribute approximately $11,000 property taxes to the Town of Canmore**
The above figures have been rounded and are approximations.

4.4 Municipal Assessment

The portion of assessment for land, buildings and improvements for the area of the M.D. of Bighorn in which the companies under review are located amount to approximately $130.7 million. As indicated in Table 5, following page, the total assessment for the companies surveyed is $57.1 million or approximately 44% of applicable assessment. The industries actual pay-out for both property taxes and the Provincial School Foundation Levy is $800,417 which account for approximately 48% of municipal revenues for: general operations; Canmore Hospital #80 supplementary; the Provincial School Foundation; and Exshaw School District #1699. Taxation revenues from Lafarge Canada Ltd, at $627.4 thousand during 1990, account for approximately 37% of municipal revenues indicating that its operations, as well as those of the other companies, are vital to the long-term economic health and stability of the Municipality of Bighorn. Plant closures and/or relocations would have a dramatic negative impact on municipal and school district revenues with the result that a major financial burden would be transferred to the residential tax base.

5.0 POTENTIAL FOR FUTURE DEVELOPMENT

5.0 POTENTIAL FOR FUTURE DEVELOPMENT

As outlined in Table 1 - opposite page 12, during 1988, more than $750 million or 10 % of total Canadian production of structural materials (sand and gravel, limestone, dimension stone, silica sand and clay) was produced in Alberta while Alberta's share of Canadian structural material production during 1989 and 1990 is estimated to be 13% and 12% respectively. Approximately 50% of Alberta's production comes from huge supplies of high quality structural materials currently being extracted and processed in the Canmore and M.D. of Bighorn region forming a broad and valuable base from that region for Alberta industry. (Alberta Research Council, 1991).

The presence of existing companies within the region and reasonable industrial assessment coupled with a close proximity to a well developed industrial infrastructure such as transportation, highways, economic natural gas and electricity attracts large capital investment vital to the development of a stable, diversified Alberta economy. The most recent examples of new capital investment and diversification are the recent developments of the two Baymag magnesite and magnesium oxide processing plants and the planned construction of two additional plants - one by Baymag and the other by National Silicates.

5.1 Limestone

Alberta is well endowed with limestone and although limestone bearing strata of various types and diverse origins are exposed in the Rocky Mountains and Foothills, those with the most reasonable economic potential are confined to the Front Ranges of the Rocky Mountains near Exshaw. Some of the major Alberta reserves of high-grade limestone located in the Bow Corridor region are very accessible; have a life span of over 50 years; are close to railways, highways, reasonably priced power, the established communities of Canmore, Exshaw and Harvie Heights with easy access to skilled labor forces located in those communities and the City of Calgary. (Alberta Research Council, 1991)

The limestone resources of the region are of substantial provincial significance through value added to the Alberta economy through forward linkages with the manufacturing, construction, processing and agriculture sectors. Proven limestone reserves near Exshaw are estimated at 20 million tonnes with an estimated 60 million tonnes of unproven reserves. (Alberta Energy, 1989) and most of the dramatic increase in the annual production of limestone in Alberta is attributable to value of production gains in the cement and lime industries. The value of cement production climbed from $97.5 million in 1979 to $126.5 million in 1988 and the value of lime production increased from $7 million in 1979 to $17.6 million during 1988. Approximately 1.5 tonnes of limestone are required for each tonne of cement and 2 tonnes for each tonne of lime produced.

Portland cement, one of the most versatile and widely used of construction materials, is manufactured from limestone and clay. Demand for cement and its production is directly linked to building construction levels which may be tracked through the value of building construction activity. Total building construction in Alberta reached $5.6 billion in 1990 compared to $3.9 billion in 1985. (Statistics Canada, Catalogue 64.201). The percentage value of Alberta's cement production and the percentage value of Alberta construction of Canadian totals are similar and "... since cement consumption is very strongly related to construction value, this indicates that Alberta {is} close to self sufficient." (Alberta Energy, 1989, pg 2)

The increase in building construction noted above; the projected growth of the City of Calgary and region; the $1.3 billion dollars of planned tourism and recreation facility development throughout the Bow Corridor region; and, the planned development in the pulp and paper and other major industrial projects will increase pressure to expand the extraction of known limestone reserves from the region for the production of concrete products.

There are two cement plants in Alberta - one in Edmonton and one in Exshaw. The Exshaw plant has the capacity to supply the entire Alberta market and is well positioned to serve the City of Calgary; the Bow-Corridor; southern regions of the province and U.S. markets. It is estimated that if the Exshaw plant was not in production, the price of cement in the City of Calgary and southern Alberta would be significantly higher than today (Alberta Energy, 1989) which would have a serious negative impact on the economic development and diversification aspirations of the region and southern Alberta.

The Energy and Non-Renewable Resources Sub-Committee of the Environment Council of Alberta in the paper *Foundations for the Future: Alberta's Mineral Resources* report that the application of limestone in the agriculture sector has considerable growth potential. There are more than 2 million hectares of acid soils in Alberta and the Peace River region of British Columbia that could benefit from applications of limestone. Based on the amount of acid soil throughout Alberta in 1985, and an application rate of 4.5 tonnes per hectare (to raise the soil pH by 0.5), it is predicted that about 320 thousand tonnes of limestone will be needed annually in order to prevent soil acidification. An additional 390 thousand tonnes per year would be required to raise the pH of existing soils with a pH of less than 5.5 by 0.5 in 10 years time. (Environment Council of Alberta,1989) ((Hoyt n.d.)

In light of increasing demand for cement and concrete products and, limestone and lime, it appears certain that provincial and local markets will demand sizable expansion in output. Cement, limestone and lime will continue to play an important role in the industrial and agricultural development of the province increasing the provincial significance of the Bow Corridor mineral reserves.

5.2 Sand and Gravel

The availability, accessibility, quality, quantity, and cost of aggregate are important to Alberta's economy. Aggregates are used in most engineered works including building construction, roadways, residential and commercial construction, as fill, and in roofing materials, drainage layers, back-fill and concrete in large projects such as dams, plant sites, and airports.

Extraction of sand and gravel as a source of aggregate is a major industry. In 1987, Alberta produced more than 44 million tonnes of sand and gravel worth more than $141 million. In 1983, production amounted to almost 20 tonnes of sand and gravel for every Albertan -- a rate of use about 40 percent higher than Ontario's. (Environment Council of Alberta, 1989) In quoting previous studies, the Energy and Non-Renewable Resource Sub-Committee of the Environment Council indicate that " ... while there is no immediate shortage of sand and gravel throughout the province ... severe shortages are occurring in some regions --- since demand and supply are local --- depending on construction and development and land use -- great care must be taken to protect known reserves -- costs are rapidly escalating for structural materials and the construction of engineered works." (ibid, pg 12)

Demand and supply for sand and gravel are locally dependant on construction, development and land use, consequently, the planned development of the tourist sector throughout the Bow Corridor will generate sizable local demand for high quality sand and gravel that is accessible by short trucking hauls. With predictions or concern over potential regional shortages, the importance of and demand for sand and gravel throughout the Bow Corridor will increase. It will be prudent to avoid sterilizing known reserves in the region through inappropriate land use designations.

5.3 Stone

Although annual production of stone relative to that of other structural material from the region is minor, the dimension stone industry remains important to the region and the province for two main reasons. First, many historical and picturesque buildings in the Banff Town-site and National Park were built with Rundle Stone from the above quarries and existing municipal and national park development controls are designed to protect existing architectural themes; second, there is great interest in preserving and restoring historically valuable buildings. (Environment Council of Alberta,1989)

6.0 IMPLICATIONS FOR FUTURE POLICY DECISIONS

6.0 IMPLICATIONS FOR FUTURE POLICY DECISIONS

Managing land use is a process of ensuring that various potential resources are used in ways that are complementary, not conflicting. The Bow Corridor is particularly rich in renewable resources such as tourism potential and in non-renewable resources such as minerals. All sectors are required for a diverse, well-balanced economic and social structure in the region.

Inadequate planning can lead to conflict, as the Energy and Non-Renewable Resource Sub-Committee of the Environment Council of Alberta has pointed out. In its 1989 report, the sub-committee cited a B.C. situation in which a company owned the mineral rights on land that was developed prematurely for recreation. The mining company's eventual attempt to exercise its mineral rights led to public confrontation.

Scenarios such as this can be avoided, suggests the sub-committee. ". . . Once potentially useful mineral deposits have been identified, steps may be taken to ensure that access to the deposits is maintained and that the option to exploit these resources is not squandered through lack of foresight." (Environment Council of Alberta, 1989, p.12.) Such steps include restricting the land use for known deposits to mineral extraction until the resource is developed. Then the land would be reclaimed for the purposes of recreation, wildlife habitat or tourism--uses that are fully compatible with previously mined, properly reclaimed land.

In view of the present and future importance of the rock industry in the Bow Corridor region outlined in this report, the following principles should be considered in developing future land use policy.

1. To maintain balanced development that is complementary to all sectors, the contributions of the rock industry should be recognized.

2. Meaningful consultation with the industry should precede any final decision on land use planning in the region.

3. As recommended by the Environment Council of Alberta (ibid.), policy makers and planners should avoid making known mineral deposits permanently inaccessible.

4. Industry should be encouraged to consult and work with the local municipalities in identifying strategies to minimize the visual impact of its plants and quarry operations.

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APPENDIX 1

COMPANY PROFILES

COMPANY PROFILE - BOW CORRIDOR

BAYMAG
800, 10655 Southport Road, S.W.
Calgary, Alberta T2W 4Y1

CURRENT OPERATIONS

Minerals processing - production of calcined and fused magnesia at Plant I and Plant II respectively.

Municipal Business/Industrial Assessment

Buildings, land & equipment	$16,400,000
Municipal Taxes	$100,000

Contracts/Local Suppliers

Average annual purchases during the past five years including power and gas.

Canmore, Exshaw, Banff	$3,500,000 per annum
Calgary region	4,300,000 per annum

Estimated Replacement Value of Existing Facilities

Buildings and Equipment	$60,000,000

Leases

1. Lease arrangements with Lafarge Canada Inc. for operating Plant I on their premises since 1982. Renewable lease.
2. Crown land lease for 25 years for Plant II. Remaining lease is approximately 21 years.

Production

Average during last five years 100,000 m.t. per annum

Sales

Two main markets are the pulp and paper industry and the animal feed market.

Last five years			
Local	In excess of $12,500,000	or	$2,500,000 per year
Outside Alberta and Exports	In excess of $112,500,000	or	$22,500,000 per year

Employment	***Bow Corridor***	***Calgary Region***
Direct Jobs	100	22

Annual Local Payroll $4,200,000

Number of Employees Residing Within the Bow Corridor by Location

M.D. of Bighorn	9
Canmore	70

PMC

MAJOR NEW DEVELOPMENT

Project	Construction of Plant III Exshaw	
Project Value	$40,000,000	
Project Description	50,000 m.t. per year calcining production facility	
Location	Exshaw	
Status of Project	Preliminary engineering	
Project Contractors	Not defined at this time	
Employment	***Bow Corridor***	***Calgary Region***
Total Direct Construction	130	
Total Permanent	30	5

COMPANY PROFILE - BOW CORRIDOR

Burnco Rock Products Ltd
Suite 200, 155 Glendeer Circle S.E.
Calgary, Alberta T2H 2P9

CURRENT OPERATIONS

Ready-mix concrete plant and gravel pit operation.

Bow Corridor operations consists of a ready-mix concrete plant, shop, and truck storage facility all located within the Town of Canmore; a parcel as yet undeveloped industrial land located in the Town of Canmore's Elk Run industrial park; and, two active gravel pits one of which is located at the SML 850084 lease site (leased from the Crown) North of highway 1A between Canmore and Exshaw and the other located on land owned by Continental Lime Ltd. north of highway 1A and east of Exshaw.

Municipal Business/Industrial Assessment

Land, Buildings and Equipment:	$11,000	
Local Taxes:	$10,970 (1990)	$10,050 (1989)

Contracts/Local Suppliers

Average annual purchases during the past five years

Local Trucking Firms	$ 200,000 per annum
Local Suppliers	800,000 per annum

NP: several million dollars of cement purchased from Lafarge and several thousand dollars from Thunderstone Quarries, Pigeon Mountain.

Estimated Replacement Value of Existing Facilities $ 1,400,000

NB: Company intends to move current Canmore ready-mix concrete and shop operations to newly acquired lot in Elk Run industrial subdivision in Canmore. Capital investment will increase by several hundred thousand dollars.

Leases

Two operating leases: SML 850084 Crown land - to be renewed prior to 1995; Continental Lime (no details provided re: termination or renewal date) and a third inactive Crown lease at Seebe.

PMC

Production

Sand & Gravel - Confidential

Concrete - Annual average of 20,000 cu. metres per year. Based on $80.00 per cu. metre, output is estimated at $ 1.6 m per year

Sales

Confidential

Employment	***M.D. of Bighorn***	***Canmore***
Direct Jobs	2	11

Annual Payroll $ 430,000

Number of Employees Residing Within the Bow Corridor by Location

M.D. of Bighorn	3
Canmore	10

COMPANY PROFILE - BOW CORRIDOR

Continental Lime Ltd
190, 3025 12 Street, N.E.
Calgary, Alberta T2E 7J2

CURRENT OPERATIONS

Open Pit Mining - Controls limestone deposit that is 97% pure calcium carbonate. Mining of high grade calcium limestone deposit and producer of lime and ground limestone since the late 1800's.

Transportation - Limestone deposit is ideally located because of its close proximity to Highway 1A, Trans Canada Highway, C.P. Rail and the Canadian Western Natural Gas pipeline.

Municipal Business/Industrial Assessment

Buildings:	$ 2,072,980
Land:	187,470
Machinery & Equip	3,239,910
Local Taxes	77,000

Contracts/Local Suppliers

Average annual purchases during the past five years including power and natural gas.

Local Trucking Firms	$ 3,900,000
Local Suppliers	5,830,000
Banff & Canmore Suppliers	207,000

Estimated Replacement Value of Existing Facilities $ 60,000,000

Leases

Nine crown leases.

Production

Annual capacity of 350,000 tonnes

Annual Average Sales

	1987 to 1990
Tonnes (within Alberta)	214,500
Tonnes (outside Alberta including Export)	90,000
Total Tonnes	304,500
Value (within Alberta)	$ 11,900,000
Outside Alberta	5,100,000
Total Value	$ 17,000,000

Employment	***Exshaw Region***	***Calgary***
Direct Jobs	56	10

Annual Payroll $ 2,300,000

Number of Employees Residing Within the Bow Corridor by Location

M.D. of Bighorn	14
Canmore	42

COMPANY PROFILE - BOW CORRIDOR

Lafarge Canada Inc., Western Region
12th Floor, Southland Tower
10655 Southport Road S.W.
Calgary, Alberta T2W 4Y1

CURRENT OPERATIONS

Cement Manufacturing & Open Pit Mining - Extraction of high grade limestone from seven crown leases as feedstock for the company's cement manufacturing plant located in Exshaw, Alberta. The Exshaw plant is a major producer of cement products for consumption in Alberta, British Columbia, Saskatchewan, Manitoba and bordering states of the United States of America. Operations in Exshaw were started in 1906.

Strategic Location - Limestone deposit and cement manufacturing plant are ideally located because of close proximity to the limestone reserves, the major cement markets and the advantages of excellent major transportation routes - Highway 1A, Trans Canada Highway, C.P. Rail - as well as proximity to electrical power and the Canadian Western Natural Gas pipeline.

Municipal Business/Industrial Assessment

Buildings, Land, Machinery & Equipment:	$ 44,783,010
Local Taxes:	627,410
Royalties:	63,000

Contracts/Local Suppliers

Average annual purchases during the past five years including power and gas.

Banff	$ 300,000
Canmore	650,000
Exshaw	10,500,000
TOTAL	$ 11,450,000

Estimated Replacement Value of Existing Facilities $ 203,000,000

Leases

Seven crown leases preceded by leases going back to 1909.

PMC

Production

Capacity of 1.1m m.t. of clinker annually.

Sales

ANNUAL AVERAGE SALES - EXSHAW PLANT

	1987 to 1990
Tonnes	870,000 *
Value (within Alberta)	$ 57,000,000
Outside Alberta	45,000,000
Total Value	$ 102,000,000

Employment

	Bow Corridor
Direct Jobs	163

Annual Local Payroll $ 8,696,000 for the Exshaw plant employees.

Number of Employees Residing Within the Bow Corridor by Location

Exshaw	43
Canmore	110
Outside region	10

* Includes clinker which is shipped to Winnipeg and ground into cement. Cement production statistics per Table 1 excludes clinker production shipped to Winnipeg.

COMPANY PROFILE - BOW CORRIDOR

National Silicates Ltd.
P.O. Box 69, Station N
Toronto, Ontario M8V 3S7

MAJOR NEW DEVELOPMENT

Project	Construction of a chemical plant for the processing of solid sodium silicate.
Project Value	$12,000,000
Project Description	potential production capacity of 70 to 80 m.t. per day or 275,000 m.t. per year of solid sodium silicate.
Location	Exshaw
Status of Project	Preliminary engineering
Project Contractors	Not defined at this time
Employment	40 persons during construction 12 permanent once operational

APPENDIX 2

TOTAL MULTIPLIERS
ALBERTA BUREAU OF STATISTICS

PMC

TABLE 6

TOTAL MULTIPLIERS (ABSOLUTE FORM, WITH LEAKAGES)
BY DETAILED INDUSTRY, 1984

INDUSTRY	HOUSEHOLD INCOME	G.D.P. AT FACTOR COST	EMPLOY-MENT	GROSS OUTPUT
1 AGRICULTURE	0.561	1.037	0.299	2.836
2 FORESTRY	0.613	1.017	0.152	2.556
3 FISHING, HUNTING AND TRAPPING	1.382	1.940	0.402	5.410
4 COAL MINES	0.583	1.056	0.159	2.404
5 PETROLEUM AND GAS WELLS	0.313	0.978	0.069	1.921
6 OTHER MINES AND QUARRIES	0.644	1.098	0.196	2.557
7 SERVICES INCIDENTAL TO MINING	0.704	1.054	0.202	2.725
8 MEAT AND POULTRY PRODUCTS INDUSTRY	0.541	0.882	0.238	3.361
9 DAIRY FACTORIES	0.570	0.928	0.228	3.014
10 MISC. FOOD INDUSTRIES	0.514	0.843	0.210	2.886
11 BEVERAGE INDUSTRIES	0.500	0.829	0.154	2.356
12 RUBBER INDUSTRIES	0.751	0.713	0.240	2.804
13 LEATHER INDUSTRIES	0.702	0.937	0.302	2.857
14 TEXTILE INDUSTRIES	0.440	0.689	0.158	2.057
15 CLOTHING INDUSTRIES	0.528	0.864	0.233	2.072
16 WOOD INDUSTRIES	0.735	1.006	0.229	2.945
17 FURNITURE AND FIXTURES INDUSTRIES	0.718	0.844	0.264	2.572
18 PAPER AND ALLIED INDUSTRIES	0.468	0.860	0.132	2.325
19 PRINTING AND PUBLISHING	0.687	1.017	0.240	2.476
20 PRIMARY METAL INDUSTRIES	0.399	0.695	0.108	2.037
21 METAL FABRICATING INDUSTRIES	0.627	0.866	0.204	2.383
22 MACHINERY INDUSTRIES	0.549	0.824	0.174	2.171
23 TRANSPORTATION EQUIPMENT INDUSTRIES	0.702	0.955	0.254	2.446
24 ELECTRICAL PRODUCTS INDUSTRIES	0.582	0.727	0.219	2.249
25 NON-METALLIC MINERAL PRODUCTS INDUSTRIES	0.612	0.908	0.179	2.526
26 PETROLEUM AND COAL PRODUCTS INDUSTRIES	0.448	1.196	0.102	3.382
27 CHEMICAL AND CHEMICAL PRODUCTS INDUSTRIES	0.388	0.840	0.103	2.498
28 MISC. MANUFACTURING INDUSTRIES	0.590	0.837	0.220	2.347
29 CONSTRUCTION INDUSTRY	0.717	0.965	0.212	2.748
30 WHOLESALE AND RETAIL TRADE INDUSTRY	0.999	1.318	0.413	2.984
31 TRANSPORTATION AND STORAGE INDUSTRY	0.648	1.084	0.221	2.642
32 COMMUNICATIONS INDUSTRY	0.762	1.240	0.224	2.505
33 UTILITIES	0.592	1.499	0.126	2.271
34 FINANCE, INSURANCE AND REAL ESTATE	0.558	1.130	0.096	2.099
35 HEALTH AND HOSPITAL INDUSTRY	1.180	1.440	0.350	3.161
36 BUSINESS SERVICES INDUSTRY	1.038	1.354	0.329	2.998
37 ACCOMMODATION AND FOOD SERVICES INDUSTRY	0.810	1.142	0.418	2.813
38 OTHER PERSONAL AND MISC. SERVICES INDUSTRY	0.828	1.225	0.419	2.737
39 DUMMY INDUSTRY I (1)	0.304	0.434	0.119	2.091
40 DUMMY INDUSTRY II (2)	0.487	0.740	0.190	2.757
41 TRANSPORTATION MARGINS (3)	0.273	0.459	0.093	2.114
42 HOUSEHOLDS (4)	0.370	0.597	0.133	2.293

SEE FOOTNOTE(S) AT END OF TOTAL MULTIPLIERS TABLES

TABLE 8

TOTAL MULTIPLIERS (RATIO FORM, WITH LEAKAGES)
BY DETAILED INDUSTRY, 1984

INDUSTRY	HOUSEHOLD INCOME	G.D.P. AT FACTOR COST	EMPLOY-MENT	GROSS OUTPUT
1 AGRICULTURE	2.655	2.534	1.882	2.836
2 FORESTRY	1.962	1.926	2.974	2.556
3 FISHING, HUNTING AND TRAPPING	2.113	2.673	2.670	5.410
4 COAL MINES	1.955	1.874	2.303	2.404
5 PETROLEUM AND GAS WELLS	3.161	1.658	4.791	1.921
6 OTHER MINES AND QUARRIES	2.071	1.957	2.486	2.557
7 SERVICES INCIDENTAL TO MINING	1.814	1.981	2.221	2.725
8 MEAT AND POULTRY PRODUCTS INDUSTRY	5.530	8.470	9.983	3.361
9 DAIRY FACTORIES	3.097	3.718	4.740	3.014
10 MISC. FOOD INDUSTRIES	3.531	4.118	4.739	2.886
11 BEVERAGE INDUSTRIES	2.059	2.018	2.476	2.356
12 RUBBER INDUSTRIES	1.807	4.778	1.892	2.804
13 LEATHER INDUSTRIES	1.985	2.500	1.773	2.857
14 TEXTILE INDUSTRIES	1.872	1.967	1.831	2.057
15 CLOTHING INDUSTRIES	1.622	1.598	1.456	2.072
16 WOOD INDUSTRIES	2.221	2.827	2.329	2.945
17 FURNITURE AND FIXTURES INDUSTRIES	1.796	2.405	1.751	2.572
18 PAPER AND ALLIED INDUSTRIES	2.206	1.982	2.807	2.325
19 PRINTING AND PUBLISHING	1.677	1.792	1.680	2.476
20 PRIMARY METAL INDUSTRIES	1.948	1.968	2.461	2.037
21 METAL FABRICATING INDUSTRIES	1.734	1.959	1.834	2.383
22 MACHINERY INDUSTRIES	1.690	1.772	1.811	2.171
23 TRANSPORTATION EQUIPMENT INDUSTRIES	1.658	1.854	1.645	2.446
24 ELECTRICAL PRODUCTS INDUSTRIES	1.746	2.148	1.679	2.249
25 NON-METALLIC MINERAL PRODUCTS INDUSTRIES	1.906	2.199	2.213	2.526
26 PETROLEUM AND COAL PRODUCTS INDUSTRIES	9.212	36.320	15.796	3.382
27 CHEMICAL AND CHEMICAL PRODUCTS INDUSTRIES	3.253	3.134	4.409	2.496
28 MISC. MANUFACTURING INDUSTRIES	1.756	1.990	1.671	2.347
29 CONSTRUCTION INDUSTRY	2.113	2.524	2.493	2.748
30 WHOLESALE AND RETAIL TRADE INDUSTRY	1.551	1.825	1.413	2.984
31 TRANSPORTATION AND STORAGE INDUSTRY	1.945	2.032	1.901	2.642
32 COMMUNICATIONS INDUSTRY	1.571	1.564	1.763	2.505
33 UTILITIES	1.665	1.370	2.534	2.271
34 FINANCE, INSURANCE AND REAL ESTATE	1.580	1.423	3.493	2.099
35 HEALTH AND HOSPITAL INDUSTRY	1.465	1.735	1.600	3.161
36 BUSINESS SERVICES INDUSTRY	1.548	1.768	1.647	2.998
37 ACCOMMODATION AND FOOD SERVICES INDUSTRY	1.694	1.940	1.402	2.813
38 OTHER PERSONAL AND MISC. SERVICES INDUSTRY	1.632	1.762	1.359	2.737

APPENDIX 3

MULTIPLIER CALCULATIONS BY COMPANY

DETAILED INDIRECT ECONOMIC IMPACTS CALCULATION by COMPANY

The following calculations of the combined direct, indirect and induced economic impacts on household income, GDP at factor cost, and gross output are based on the total multipliers (absolute form with leakages) and calculations for employment are based on the total multipliers (ratio form, with leakages) as provided by Alberta Treasury, Bureau of Statistics (Alberta Treasury, 1991). The complete tables are provided in Appendix 2.

Baymag - Plants I and II

The Baymag plants are reported to have a permanent work-force of 100 persons with an estimated production of 100,000 m.t. or $25 m per year of calcined and fused magnesia.

Table 6, Line 25, Non-metallic Mineral Products Industries - absolute form

- household income 0.612 x $ 25 = $ 15.3 m
- GDP at factor cost 0.908 x $ 25 = $ 22.7 m
- gross output 2.526 x $ 25 = $ 63.2 m

Table 8, Line 25, Non-metallic Mineral Products Industries - ratio form

- employment 2.213 x 100 = 221 persons

Baymag Planned New Construction

Baymag is planning the construction of a third plant near Exshaw with a potential production capacity of 50,000 m.t. The cost of construction is estimated to be $40,000,000 which will employ approximately 40 people during construction and have a permanent work-force of 35.

Table 6, line 29, construction industry - absolute form

- household income 0.717 x $40 m = $ 28.7 m
- GDP at factor cost 0.965 x $40 m = $ 38.6 m
- gross output 2.748 x $40 m = $ 110 m

Table 8, line 29, construction industry - ratio form

- employment 2.493 x 40 = 100 persons

Baymag New Plant Annual Production - Longer Run Impact

Once operational, plant III is reported to have an estimated production capacity of 50,000 m.t or $12.5 m per year of calcined product with a permanent work-force of 35.

Table 6, Line 25, Non-metallic Mineral Products Industries - absolute form

- household income 0.612 x $ 12.5 m = $ 7.7 m
- GDP at factor cost 0.908 x $ 12.5 m = $ 11.4 m
- gross output 2.526 x $ 12.5 m = $ 31.2 m

Table 8, Line 25, Non-metallic Mineral Products Industries - ratio form

- employment 2.213 x 35 = 78 persons

Burnco Rock Products Ltd

BURNCO is reported to have a permanent work-force of 13 in the Bow Corridor. The estimated annual production is $2.5 million. Actual figures are confidential.

Table 6, Line 25, Non-metallic Mineral Products Industries - absolute form

- household income 0.612 x $ 2.5 = $ 1.5 m
- GDP at factor cost 0.908 x $ 2.5 = $ 2.3 m
- gross output 2.526 x $ 2.5 = $ 6.3 m

Table 8, Line 25, Non-metallic Mineral Products Industries - ratio form

- employment 2.213 x 13 = 29 persons

Continental Lime Ltd

Continental Lime Ltd. is reported to have a permanent work-force of 66 (56 in Bow Corridor and 10 in Calgary). The estimated annual production of lime is 304,000 m.t. or $23.7 m (calculated on an average price of $78 per m.t. based upon Statistic Canada averages).

Table 6, Line 25, non-metallic mineral products - absolute form

- household income 0.612 x $17 m = $ 10.4 m
- GDP at factor cost 0.908 x $17 m = $ 15.4 m
- gross output 2.526 x $17 m = $ 42.9 m

Table 8, line 25, non-metallic mineral products - ratio form

- employment (Table 8, line 25) 2.213 x 56 = 124 persons

Lafarge Canada Inc.

Lafarge Canada Inc. is reported to have a permanent work-force of 200 (163 in Exshaw and 37 in Calgary). The estimated annual production of cement is 870,000 m.t. or $102 m.

Table 6, line 25, non-metallic mineral products - absolute form

- household income 0.612 x $102 m = $ 62.4 m
- GDP at factor cost 0.908 x $102 m = $ 92.6 m
- gross output 2.526 x $102 m = $ 257.7 m

Table 8, line 25, non-metallic mineral products - ratio form

- employment (Table 8, line 25) 2.213 x 163 = 361 persons

National Silicates New Construction

National Silicates is planning the construction of a new plant near Exshaw with a potential production capacity of 70 to 80 m.t. or 274,000 m.t. per year of solid sodium silicate. The cost of construction is estimated to be $12,000,000 which will employ approximately 40 people during construction and have a permanent work-force of 12.

Table 6, line 29, construction industry - absolute form

- household income 0.717 x $12 m = $ 8.6 m
- GDP at factor cost 0.965 x $12 m = $ 11.6 m
- gross output 2.748 x $12 m = $ 33 m

Table 8, line 29, construction industry - ratio form

- employment 2.493 x 40 = 100 persons

National Silicates Annual Production - Longer Run Impact

Once operational the National Silicates plant is reported to have an estimated production capacity of 275,000 m.t. Pricing structure is confidential and consequently, the direct, indirect and induced impact on household income, GDP at cost and gross output is not presented.

Table 6, Line 27, chemical and chemical products - inorganic chemicals - absolute form

- household income 0.388 x $ n/a = n/a
- Gross Domestic Product (GDP) at factor cost 0.840 x $ n/a = n/a
- gross output 2.498 x $ n/a = n/a

Table 8, line 27, chemical and chemical products - inorganic chemicals - ratio form

- employment 4.409 x 12 = 53 persons

APPENDIX 4

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